

## NOTES, INFORMATION & NEWS

### Observations on the Reproduction of *Pugilina morio* (Linnaeus, 1758) (Mollusca: Gastropoda: Melongenidae)

Helena Matthews-Cascon

Departamento de Biologia, Centro de Ciências,  
Universidade Federal do Ceará, Campus do Pici,  
60455-970, Fortaleza, Ceará, Brazil; hmc@ufc.br

Inês Xavier Martins

Centro de Ciências da Saúde, Universidade de Fortaleza  
(UNIFOR), Av. Washington Soares, 1321, Edson  
Queiroz, Fortaleza—Ceará—Brazil; ixmartins@unifor.br  
and

Evelyne Ximenes Barbosa

Departamento de Biologia, Centro de Ciências,  
Universidade Federal do Ceará, Campus do Pici,  
60455-970, Fortaleza, Ceará, Brazil

The family Melongenidae is represented in Brazil only by the species *Pugilina morio* (Linnaeus, 1758) (Matthews, 1967; Rios, 1994) (Figure 1) which is very common in estuarine areas. *Pugilina morio* is a slow moving predator that preys mainly on bivalves using the foot to embrace the prey, putting the outer lip of the shell between the valves, and then introducing the pleurembolic proboscis (Matthews-Cascon et al., 1990). This species has a sexually dimorphic shell, with the females having a larger body whorl than the males (Matthews-Cascon et al., 1990). Some human populations use *Pugilina morio* as a food source.

In the present study the following aspects of *Pugilina morio* spawn were studied: size of the egg capsules deposited per female, number of eggs per capsule, and the length of the development period.

In July of 1998, 56 egg capsules and 30 adults of *Pugilina morio* (20 females, 10 males) were collected in the estuary of the Ceará River, Fortaleza, Ceará, Brazil (0.38°35'15"W; 0.3°41'54"S) and transferred to the laboratory where they were kept in well aerated 60 liter water tanks at a constant temperature (28°C) and salinity (30‰) and fed *ad libitum* during 3 months.

We measured length and width of egg capsules and counted the number of eggs in each for 60 capsules laid in the tanks by the 20 females and 56 collected in the field. To determine the duration of the intracapsular trochophore and veliger stages and the period until hatch-

ing, 10 capsules were observed daily, and the stage of development of most individuals was recorded.

To determine the spawning season, monthly field observations were made from January 1998 to December 1999 in the estuary of the Ceará River.

### Results

The reproductive period of *Pugilina morio* in the estuary of the Ceará River during both years, 1998 and 1999, lasted from July to November with a peak in September. In the field, *P. Morio* spawned egg masses on rocks or on the pilings from the old harbor. In the laboratory, the egg masses were attached to the surface of the aquarium. The egg masses were beige when released and later became yellow.

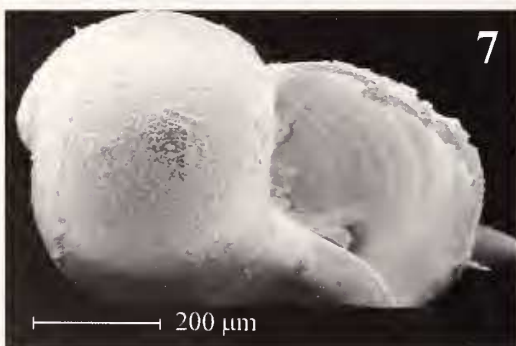
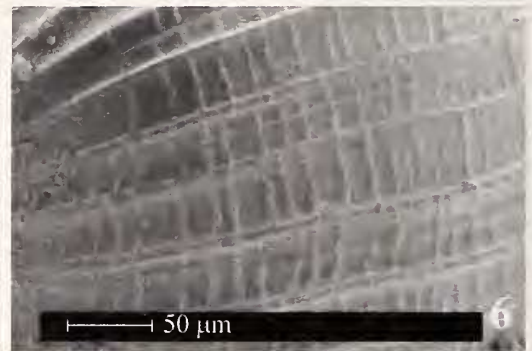
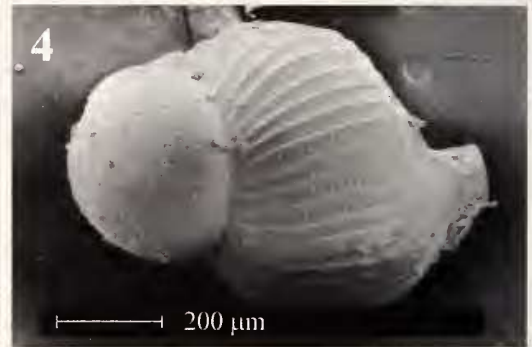
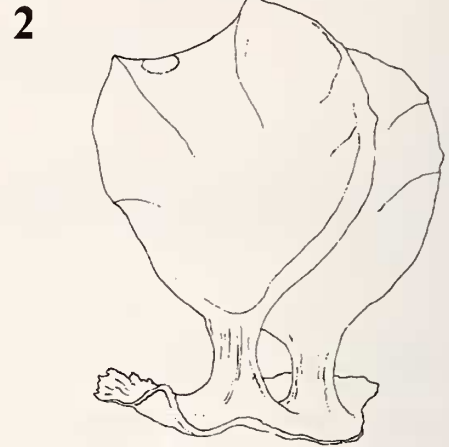
The capsules measured 10–15 mm in length (mean 13.3 mm  $\pm$  SD 0.98, n = 116) and 8–14 mm in width (mean 11.8 mm  $\pm$  SD 1.00, n = 116) (Figures 2, 3), and each capsule contained 50–167 eggs (mean 97.4  $\pm$  SD 43.2, n = 116). The *Pugilina morio* capsules have five to six ridges on the side with the exit aperture, and are smooth on the side opposite the exit aperture. Each capsule has an exit plug located laterally on the upper side of the capsule as illustrated in Figure 2. The plug covering this exit aperture was opaque with an elliptical shape, measuring between 0.8–2.5 mm in diameter (mean 1.6 mm  $\pm$  SD 0.40, n = 94).

The trochophore stage was reached by day 16 and the early veliger stage by day 30. Hatching as late stage veligers larvae occurred between 7 to 8 weeks after oviposition.

The veliger larva has a large velum with four lobes, with two lines of cilia on the edge of the velum. The protoconch has two whorls and is light brown in color (Figure 4). The first whorl has a granular appearance (Figure 5). The second whorl is clearly distinct from the first whorl and exhibits a series of ridges crossed by weak growth lines (Figure 6). The protoconch measures between 700 and 750  $\mu$ m (mean 722  $\pm$  SD 24.9  $\mu$ m, n = 10) (Figures 7, 8).

After hatching from the egg capsule at the late veliger stage, already with the foot, the larvae remained swimming around the capsule for 24 hours and then started crawling in the tank bottom, already with the velum reabsorbed. Nurse eggs were not observed, and 90% of all the embryos hatched. The other 10% did not develop and remained untouched in the egg capsule.

After the apical plug opened, the egg masses were attacked by protozoans and nematodes that ate the rest of



Figures 1–8. *Pugilina morio*. Figure 1. Female spawning. Figure 2. Egg capsules, 12 mm in length and 9 mm in width. Figure 3. Egg masses. Figure 4. SEM dorsal view of the protoconch. Figure 5. SEM detail of the first whorl of the protoconch. Figure 6. SEM, detail of the second whorl of the protoconch. Figure 7. SEM, ventral view of the protoconch. Figure 8. SEM, detail of the apertural view of the protoconch.

the material that remained inside the capsules. Some egg masses collected in the field had polychaete tubes attached.

The oviposition of egg capsules lasted for about 8 days; females did not eat until spawning was completed. Communal spawning was not observed in the laboratory.

#### Discussion

The spawning season of *Pugilina morio* in the estuary of the Ceará River determined in the present study, July to November, may be related to the occurrence of the dry season in the region during this time of the year, when the salinity in the estuary is higher. According to Matthews-Cascon et al. (1990), the time of reproduction of *Pugilina morio* at Salinas Beach, Pará State in the north of Brazil, was mainly during the months of September and October.

Hatching as free veliger larvae has also been reported in *Pugilina cochlidium* by Natarajan (1958). Most of the other members of the family studied (*Melongena*, *Hemifusus*, *Busycon*, and *Busycotypus*) have direct development (Clench & Turner, 1956; Robertson, 1974; D'Asaro, 1997); however, *Melongena melongena* from the southern Caribbean also hatches as a veliger larva (Bandel, 1975).

We did not observe nurse eggs inside the egg capsules, and Clench & Turner (1956) observed the same thing for *Melongena corona*. D'Asaro (1997) estimated the presence of 52 to 74 eggs per capsule in *Pugilina morio* from Sierra Leone, west Africa, whereas in the present study we found a wider range of 50 to 167 eggs per capsule.

The same author compared the egg capsules of populations of *Pugilina morio* from Sierra Leone, west Africa and from Gambia, west Africa and Brazil and found that in the first population the exit aperture is located in the middle of the upper side of the capsule and in the second and third population (Gambia and Brazil), the exit aperture is displaced laterally, which is consistent with our own observations.

**Acknowledgments.** We thank Dr. Paulo Cascon for helpful comments on the manuscript, Alysson Marciel Freire for the diagram, and Tito Lotufo and Carlos Augusto Oliveira de Meirelles for the photography. For assistance with electron microscopy we thank Daercio da Costa Magalhães.

#### Literature Cited

- BANDEL, C. 1975. Das embryonalgehäuse karibischer meso und neogastropoden (Mollusca). Akademie der Wissenschaften und der Literatur, Mainz 1:1–133.
- CLENCH, W. J. & R. D. TURNER. 1956. The family Melongenidae in the western Atlantic. *Johnsonia* 3:161–188.
- D'ASARO, C. 1997. Gunnar Thorson's world-wide collection of prosobranch egg capsules: Melongenidae. *Ophelia* 46:83–125.
- MATTHEWS, H. R. 1967. Notas sobre a espécie *Pugilina morio* (Linnaeus, 1758) no nordeste brasileiro. *Arquivos da Estação de Biologia Marinha Universidade Federal do Ceará* 7: 191–192.

MATTHEWS-CASCON, H., H. R. MATTHEWS & L. F. BELÚCIO. 1990. Notas sobre a anatomia, sistemática e biologia de *Pugilina morio* (Linnaeus, 1758) (Mollusca: Gastropoda). *Arquivos de Ciências do Mar* 28:3–8.

NATARAJAN, A. V. 1958. Studies on the egg mass and larval development of some prosobranchs from the Gulf of Mannar and the Park Bay. *Proceedings of Indian Academy of Science* 46:170–228.

RIOS, E. C. 1994. *Seashells of Brazil*. Editora da Fundação Universidade do Rio Grande: Rio Grande. 492 pp.

ROBERTSON, R. 1974. Marine prosobranch gastropods: Larval studies and systematics. *Thalassia Jugoslavica* 10:213–238.

### Embryonic Development of *Crepidula aculeata* (Gmelin, 1791) (Caenogastropoda: Calyptraeidae) from the Venezuelan Caribbean

Patricia Miloslavich<sup>1</sup>, Pablo E. Penchaszadeh<sup>2</sup> and Ana Karinna Carbonini<sup>1</sup>

<sup>1</sup> Universidad Simón Bolívar, Departamento de Estudios Ambientales, P.O. Box 89000, Caracas 1080, Venezuela, pmilos@usb.ve

<sup>2</sup> Laboratorio de Invertebrados, Departamento de Biología, Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires, Argentina

#### Introduction

The genus *Crepidula* Lamarek, 1799, is widely distributed in South and North America, with about 20 species in the Pacific and Atlantic coast of North America (Abbott, 1974; Hoagland, 1986), at least seven species in the Caribbean (Díaz & Puyana, 1994; De Jong & Coomans, 1988; Warmke & Abbott, 1961), and at least five species



Figure 1. Dorsal and ventral view of the adult shell of *Crepidula aculeata*.